

WHAT IS CLAIMED IS:

1. A liquid crystal display device, comprising:
 - a first transparent substrate and a second transparent substrate;
 - a liquid crystal layer interposed between the first and second substrates, the layer being made of a nematic liquid crystal material having a positive dielectric anisotropy;
 - a first electrode and a second electrode provided on the first and second substrates, respectively, for applying an electric field substantially vertical to the first and second substrates across the liquid crystal layer; and
 - a first polarizing plate and a second polarizing plate each provided on an outer side of respective one of the first and second substrates, the first and second polarizing plates being arranged in a crossed Nicols arrangement, wherein:
 - the liquid crystal layer in each pixel region includes at least a first domain and a second domain in which liquid crystal molecules are oriented in different orientations;
 - a first phase difference compensator having a

positive refractive index anisotropy is provided between the first polarizing plate and the first substrate, and a second phase difference compensator having a positive refractive index anisotropy is provided between the second polarizing plate and the second substrate, so that phase-delay axes of the first and second phase difference compensators are parallel to a substrate surface and to each other, and substantially perpendicular to a phase-delay axis of the liquid crystal layer in the absence of an applied voltage;

at least one third phase difference compensator is provided between the first polarizing plate and the first phase difference compensator or between the second polarizing plate and the second phase difference compensator;

a refractive index ellipse of the third phase difference compensator has three main axes a, b and c, and refractive indexes of na, nb and nc along the main axes a, b and c, respectively, wherein a relationship $nc > na > nb$ holds, with the main axis a and the main axis b lying in a plane parallel to the substrate surface, the main axis c being parallel to a direction normal to the substrate surface, and the main axis a being perpendicular to a polarization axis of one of the polarizing plates

which is adjacent to the phase difference compensator; and

the first, second and third phase difference compensators compensate for a refractive index anisotropy of the liquid crystal molecules of the liquid crystal layer which are in a substantially horizontal orientation with respect to the substrate surface in the absence of an applied voltage.

2. A liquid crystal display device according to claim 1, wherein:

where a retardation value of the liquid crystal layer is $d_{lc} \cdot \Delta n$, an in-plane retardation of the third phase difference compensator is $d \cdot (na - nb)$, and a retardation along a thickness direction thereof is $d \cdot (na - nc)$;

parameters RL and NZ are defined as follows

$$RL = d \cdot (na - nc) / (d_{lc} \cdot \Delta n), \text{ and}$$

$$NZ = (na - nc) / (na - nb);$$

two of the third phase difference compensators are provided respectively between the first polarizing plate and the first phase difference compensator, and between the second polarizing plate and the second phase difference compensator, with a sum of RL values of the two third phase difference compensators being defined as

RLsum; then,

$$0 \leq |RLsum| \leq 2; \text{ and}$$

each of the third phase difference compensators satisfies $\log(|NZ|) \geq 2.0 \cdot |RL| - 1.2$, where $RL < 0$ and $NZ < 0$.

3. A liquid crystal display device according to claim 2, wherein the RL value and the NZ value of one of the two third phase difference compensators are equal to the RL value and the NZ value, respectively, of the other one of the two third phase difference compensators.

4. A liquid crystal display device, comprising:

a first substrate and a second substrate at least one of which is transparent;

a liquid crystal layer interposed between the first and second substrates, the layer being made of a nematic liquid crystal material having a positive dielectric anisotropy;

a first electrode and a second electrode provided on the first and second substrates, respectively, for applying an electric field substantially vertical to the first and second substrates across the liquid crystal layer;

a first polarizing plate and a second polarizing

plate each provided on an outer side of respective one of the first and second substrates, the first and second polarizing plates being arranged in a crossed Nicols arrangement; and

a phase difference compensator, wherein:

the liquid crystal layer in each pixel region includes at least a first domain and a second domain in which liquid crystal molecules are oriented in different orientations; and

the phase difference compensator compensates for the refractive index anisotropy of the liquid crystal molecules in a substantially horizontal orientation with respect to the surfaces of the first and second substrates in the absence of the applied voltage.

5. A liquid crystal display device according to claim 4, wherein:

the first and second substrates are both transparent; and

the phase difference compensator comprises a first phase difference compensator provided between the first substrate and the first polarizing plate and a second phase difference compensator provided between the second substrate and the second polarizing plate.

6. A liquid crystal display device according to claim 5,
wherein:

the first and second phase difference compensators each have a positive refractive index anisotropy; and

phase-delay axes of the first and second phase difference compensators are substantially parallel to each other and substantially perpendicular to a phase-delay axis of the liquid crystal layer in the absence of an applied voltage.

7. A liquid crystal display device according to claim 6,
wherein:

a third phase difference compensator is further provided between the first phase difference compensator and the first polarizing plate;

the third phase difference compensator has a positive refractive index anisotropy; and

a phase-delay axis of the third phase difference compensator is substantially perpendicular to the first and second substrates.

8. A liquid crystal display device according to claim 7,
wherein:

a fourth phase difference compensator is further provided between the second phase difference compensator and the second polarizing plate;

the fourth phase difference compensator has a positive refractive index anisotropy; and

a phase-delay axis of the fourth phase difference compensator is substantially perpendicular to the first and second substrates.

9. A liquid crystal display device according to claim 8, wherein:

a fifth phase difference compensator is provided between the first phase difference compensator and the third phase difference compensator;

a sixth phase difference compensator is provided between the second phase difference compensator and the fourth phase difference compensator;

the fifth and sixth phase difference compensators each have a positive refractive index anisotropy;

a phase-delay axis of the fifth phase difference compensator is substantially perpendicular to a polarization axis of the first polarizing plate; and

a phase-delay axis of the sixth phase difference compensator is substantially perpendicular to a

polarization axis of the second polarizing plate.

10. A liquid crystal display device according to claim 4, wherein:

directors of the liquid crystal molecules in the first and second domains in the middle of the liquid crystal layer along a thickness direction thereof rise in respective directions which are different from each other by about 180° ; and

the directions are at about 45° with respect to the polarization axis of each of the first and second polarizing plates.

11. A liquid crystal display device according to claim 4, wherein the liquid crystal molecules in the first and second domains are in a horizontal orientation.

12. A liquid crystal display device according to claim 4, wherein the liquid crystal molecules in the first and second domains are in a twist orientation.

13. A liquid crystal display device according to claim 11, wherein pre-tilt angles of the liquid crystal molecules on the first and second substrates in the first domain

are different from those in the second domain.

14. A liquid crystal display device according to claim 12, wherein pre-tilt angles of the liquid crystal molecules on the first and second substrates in the first domain are different from those in the second domain.

15. A liquid crystal display device according to claim 4, wherein the liquid crystal layer in each pixel region includes a plurality of the first domains and a plurality of the second domains, the number of the first domains being the same as the number of the second domains.

16. A liquid crystal display device according to claim 4, wherein a total area of the first domains is equal to that of the second domains.